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Types and patterns: an experimental East-West-German comparison of cooperation and solidarity

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Abstract

In a study of public good and solidarity experiments conducted in eastern and western Germany, we found in both games that eastern subjects behave in a significantly more selfish manner than do western subjects. Besides that we found that many qualitative results of both data sets are similar. Since our experiments were conducted in two parts of one nation, we present an unusually well controlled cross-cultural study by avoiding difficulties that usually arise in multinational settings. We conclude that cooperation and solidarity behavior seem to depend strongly on different culture-specific norms resulting from opposing economic and social histories in the two parts of Germany. © 1999 Elsevier Science S.A. All rights reserved.

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JEL classification: C91; H41; D64; P20

1. Introduction

The most common inhabitant of economic models is ‘‘homo oeconomicus’’—a strictly rational fellow without sex, age, or cultural identity. As a consequence, for a long time experimental economists did not control for *types* of individuals (such as ethnicity, gender, educational background) when testing economic decision theory. This may have created a bias in the interpretation of the experimental data.

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In recent years, experimental economics has become a widely accepted and increasingly applied method in the international economic community. Experimental economists now work all over the world and communicate their results in journals, at conferences and via the internet. But is it really admissible to compare experimental data which are generated in different countries in different cultural contexts and with differently composed pools of subjects? Obviously, this can only be done if the *type* of the subjects does not systematically influence the observable behavior.

Some experimental economists have shown that types can be systematically identified by observing different patterns of behavior. For example, the fact that students of economics conform better to game theoretical predictions (e.g. Frank et al., 1993, 1996), can now be regarded as well known not only among experimental economists. Recently, a growing number of empirical studies have dealt with the question of whether or not the origin of subjects has any impact on behavioral patterns. For example, Ayres and Siegelman (1995) and Rapaport (1995) observe in their field studies that market outcomes depend systematically on the races of the parties involved. In an experimental study, Weimann (1994) finds that American students are less cooperative than Germans when they play a repeated public good game. Burlando and Hey (1997) take this approach and examine the cooperation behavior of British and Italians. They find that British subjects free ride to a significantly greater extent than do Italians.

Given these observations, one has to admit that there are some indications of a systematic connection between *types* and behavioral *patterns*. On the other hand, for methodological reasons, the identification of cultural influences is very difficult, particularly in the case of observed behavior. Thus, on the basis of the experimental evidence, we cannot claim free of doubt that cultural conditions systematically influence behavior. In order to illustrate the methodological issues of cross-culture studies (CCS), we refer to the study of Roth et al. (1991), in which three main problems arising from multinational studies are identified (see also Roth, 1995, 282–288): The experimenter effect, the language effect and the currency effect which are all closely related to the well-known ‘‘framing’’ effect.

In this paper, we present a CCS that avoids all the methodical problems with which Roth et al. and other studies had to struggle. Thanks to a unique historical event, the German reunification, we are able to conduct such a study. After the end of the cold war, we can now examine cultural differences, namely differences in the cooperation and solidarity behavior of subjects living in former East and former West Germany. Eastern subjects grew up in a socialist planned economy, while western subjects have been socialized in a market-oriented environment. An east–west comparison exhibits compelling methodological advantages. We do not have to deal with language and currency effects. We also eliminate any experimenter effect by involving the same experimenters in all settings of any one game. Therefore, the German reunification allows us to present an unusually well

controlled cross-cultural comparison between the new (eastern) and the old (western) states of Germany.[1]

Whether connections between types and behavioral patterns can be found in controlled experimental settings should not only be of relevance for methods of experimental economics. There may also be interesting implications for the construction of economic models—in which differences between types have consistently been ignored until now. This does not mean that the assumption in economic theory that differences in individual behavior can be traced back to differences in preferences becomes obsolete or less sensible, if types can be identified experimentally. However, it may be that, by ignoring the *variation in preferences* across types, economic theory gives away valuable and often inexpensive information which could help in building a more comprehensive *descriptive* theory of human behavior.

Seven years after the reunification of eastern and western Germany many people in the eastern part of the country, living now in a capitalist system, miss the solidarity and the cooperative spirit which developed in times of dictatorship. The common belief in Germany is that Eastgermans are still more cooperative and less selfish than Westgermans. Our CCS shows, that this does not seem to be the case.

2. Experimental designs

Our study includes two main types: eastern and western subjects. To investigate the influence of types on behavior, we concentrate on public good and solidarity games, because we expect subjects to differ more in these particular contexts than in games for which rationality does not lead to distribution conflicts or efficiency losses.[2]

2.1. Public good game

The experiment involved a standard public good game. Ten subjects were randomly divided into two groups of five. For this purpose, each subject drew a number from one to ten, which only the subject could observe. Players with numbers 1–5 formed group one, 6–10 group two. Both groups then played the following game ten times: Each player had 10 tokens which could be invested in

[1]Of course it is impossible to control for *everything* that may have an impact on the decisions of the subjects. For example, we do not know whether the fact that the experimenters are born and raised in former West Germany influenced the behavior of the eastern and western subjects differently. However, we have no reason to believe that this causes any problem.

[2]For a theoretical explanation of why heterogeneous behavior should be expected in these kinds of games and not in more market-oriented games cf. Bolton and Ockenfels (1997).

two assets. The so called *private* asset paid 0.6 labdollars (LD) per token to the player who invested that token. A token invested into the *public* asset paid 0.2 LD to each of the five group members. Each of the ten rounds was conducted the same way: players wrote their decisions on registration forms. These were collected and the experimenter publicly announced the group investments in the public asset. Given this information, the player could read off his or her payoff from a payoff-matrix, and the next round started.

After ten rounds subjects were told that the game would be played a second time. The repetition was identical to the first game with one exception. The two groups were formed in a different way: namely, the five players who invested the most in the public asset (over all rounds) in the first game were collected in one group, and the remaining players were collected in the other. This rule was publicly announced and also, which player (identified by their numbers) form the cooperators and the noncooperators groups, who then played the free-riding game ten times.

After the experiment, players were paid in cash at a rate of exchange of one German mark for three LD. The payoff procedure was organized in a way which ensured that the experiments were run under double blind conditions.[3]

The experiments were conducted at the University of Magdeburg/eastern Germany and the University of Bochum/western Germany in spring 1995. In both cases the experiments were conducted with 50 subjects in ten groups. Subjects were recruited from the economics departments. As already mentioned, the experiments were all conducted by the same experimenters.

2.2. Solidarity game

In the solidarity game each subject participates in a one-shot three-person game. Each subject independently wins DM 10,00 with probability 2/3 and zero with probability 1/3. Before the outcome was determined, subjects were asked: If you win, how much are you willing to give to a loser who is the sole loser in your group, and how much are you willing to give to each of two losers if you are the only winner. These decisions are called conditional gifts.

We replicated the experimental procedure from Selten and Ockenfels (1998). The data obtained by their experiments conducted in Bonn provide the western data for our comparison with the eastern data obtained in Magdeburg.

The experiments in Bonn were run with 120 participants in winter 1994. In

[3]The instructions and the raw data of both the public good experiments and the solidarity experiments are available upon request.

Magdeburg, we conducted one experiment with 60 participants in spring 1995. Nobody participated twice. All experiments were run under double blind conditions in the student's restaurants in Bonn and Magdeburg, respectively.[4] The experimenter was the same in both parts of Germany.

3. Results and discussion

Before conducting the experiments we were not able to predict which type, if any, would exhibit more ''selfish'' behavior. Therefore, we state the null hypothesis that subjects in East and West Germany exhibit the same behavioral patterns. This is of course appropriate from the theoretical point of view.[5] Homo oeconomicus would not change his behavior depending on whether he grows up in eastern or western Germany.

3.1. Public good experiments

Fig. 1 shows the eastern and western contributions to the public assets as percentages of the total token endowment for the first ten rounds.

The figure shows that in both experiments the standard results are replicated (compare for example Ledyard, 1995, and Weimann, 1995): contributions are significantly positive and decay with a clear final round effect. But more important is the observation that eastern subjects contributed dramatically less than did western subjects and that the null-hypothesis of equal contributions must be rejected (a one-tailed Mann–Whitney U-test yields $p \leq .05$ for each round except the last round). Applying a χ^2-test, we can also reject the null-hypothesis that the proportion of strict free-riders is the same in the two parts of Germany ($p < 0.017$).

[4]To ensure comparability to the study of Selten and Ockenfels (1998), we also supplied an additional lottery giving 25 German marks to one per thirty subjects. This lottery served to give an additional incentive to all subjects to return for their payoffs.

[5]One might think that behavior differences are due to income differences. In fact, in 1994 the arithmetic mean (median) of monthly earnings was 1343 (1246) German marks for western students and 954 (885) German marks for eastern students (Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie, 1995). However, *real income of students* does not differ substantially. Firstly, in 1993 the cost of living in Magdeburg/eastern Germany, excluding expenditures on housing was 6.2 percent below the corresponding value for Bonn/western Germany (Statistisches Bundesamt, 1994). Secondly, in 1994 western students paid on average 415 German marks for their rent. In contrast, almost all eastern subjects had the opportunity to live in a cheap lodgings and they therefore paid only 212 German marks on average for their rent (Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie, 1995). Generally, the rent per m^2 in western Germany was about 35% higher than the rent in eastern Germany (Statistisches Bundesamt, 1994).

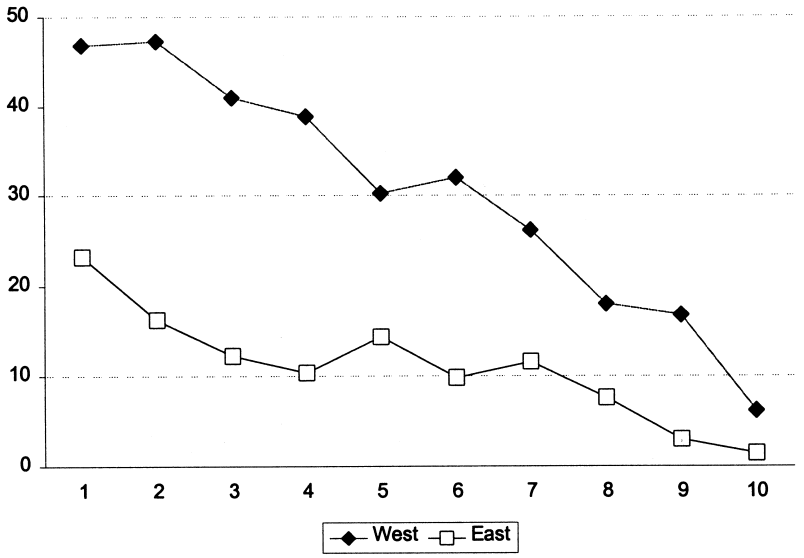

Fig. 1. Contributions in percent (first game): all subjects.

As Fig. 2 shows, the same pattern can be found in the behavior of the most cooperative players during the first game. The cooperative half of the western subjects in the *second* game invested on average 40% of their tokens compared to only 21% for the corresponding eastern subjects. The east–west ratio in the first game was 1/3, and therefore, the differences are a little bit smaller in the second game of the cooperative players. The less cooperative eastern players contributed on average 4.7% of their tokens in the second game, compared to 11.5% for the western less cooperative subjects (Fig. 3).[6]

The difference between east and west can primarily be characterized as a level-difference. In fact, some of the qualitative results are very similar. Not only are the standard results reproduced in all cases, but the effects of information about the group structure given to the subjects in the second game are also very similar. Information about the degree of cooperation does not matter within the *co-operative group*. Applying a Wilcoxon signed-rank test, we found no statistically significant differences between the behavior of cooperative players in the first ten rounds and after the pooling of cooperators, neither in western nor in eastern Germany. The same does not hold for the less cooperative players. Although they

[6]All differences are significant; cf. Ockenfels and Weimann (1997).

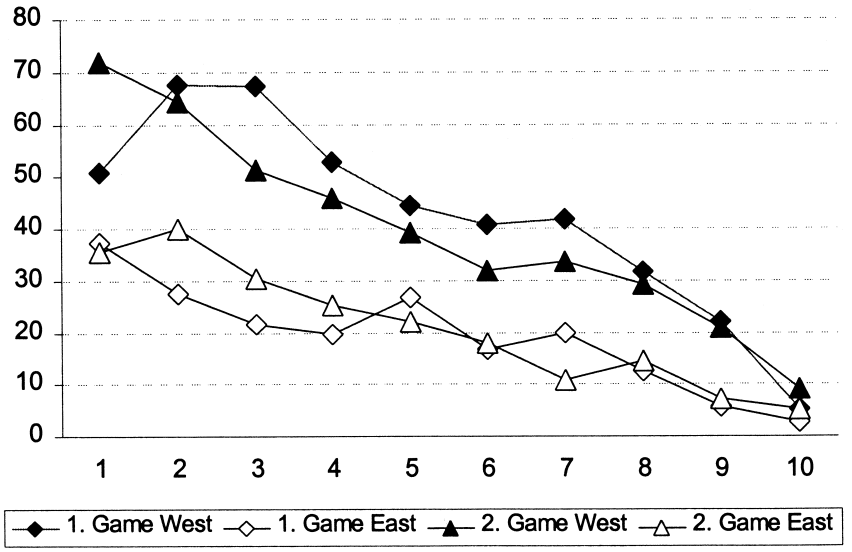

Fig. 2. Contributions in percent (both games): cooperative subjects.

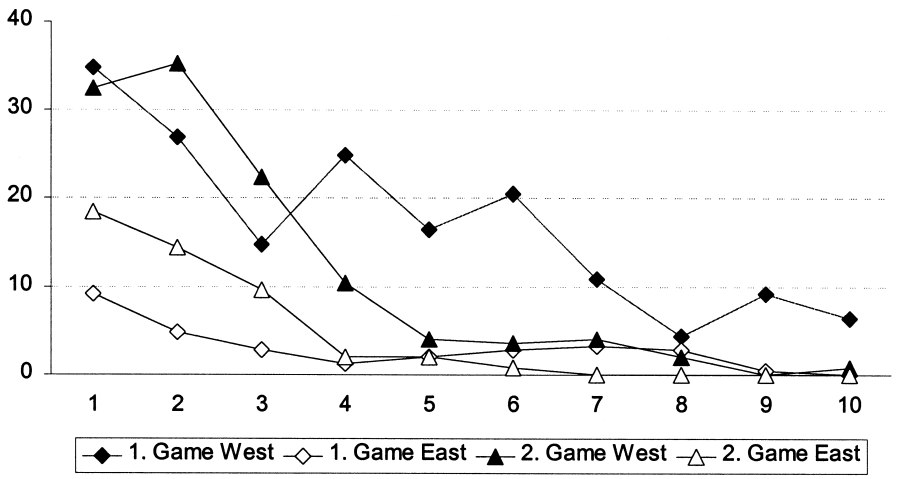

Fig. 3. Contributions in percent (both games): less cooperative subjects.

had already played at a very low level, western subjects significantly reduced their contributions (from 16.9 to 11.5%; $p<0.04$) after pooling of the less cooperative players.[7] Eastern contributions on average *increased* (from 2.9% to 4.7%), but this increase only occurs in the first three rounds. Starting with round five, eastern noncooperative contributions in the second game were below even the already very low noncooperative level of the first game.[8]

3.2. Solidarity experiments

Figs. 4 and 5 show the relative frequencies of conditional gifts in the respective ranges, separately for East and West German students. Fig. 4 corresponds to x_1, the conditional gift when there is exactly one loser, and Fig. 5 corresponds to x_2, the conditional gift for each of two losers.[9]

Obviously, eastern subjects show less solidarity in the sense that about half of the subjects in Magdeburg behaved ''egoistically'' (47% for x_1 and 48% for x_2) by giving no positive conditional gifts whereas in Bonn only 21% behaved this way

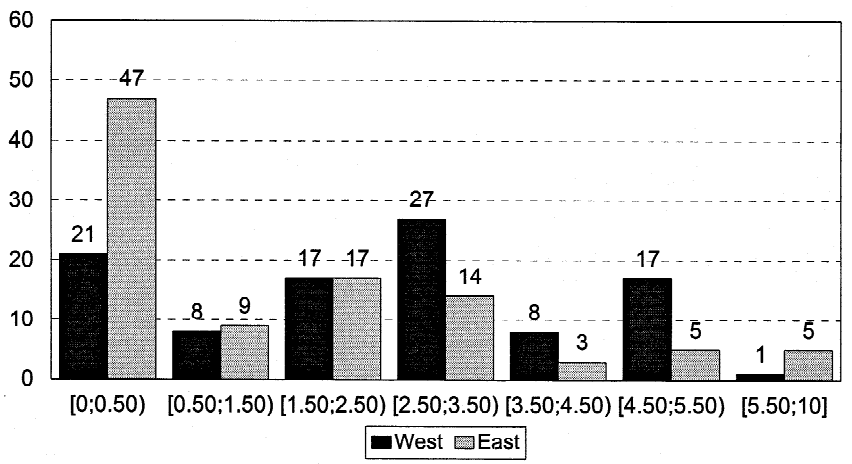

Fig. 4. Relative frequencies of choices x_1.

[7]This result is in line with the findings of Weimann (1994).

[8]We also found some differences in the distribution of the investment of cooperative east and west subjects; cf. Ockenfels and Weimann (1997) for an elaboration of this observation.

[9]According to the analysis of Selten and Ockenfels (1998), two of the 120 western subjects and two of the 60 eastern subjects are excluded from all statistical computations reported here. However, our statistical results are invariant with respect to the elimination.

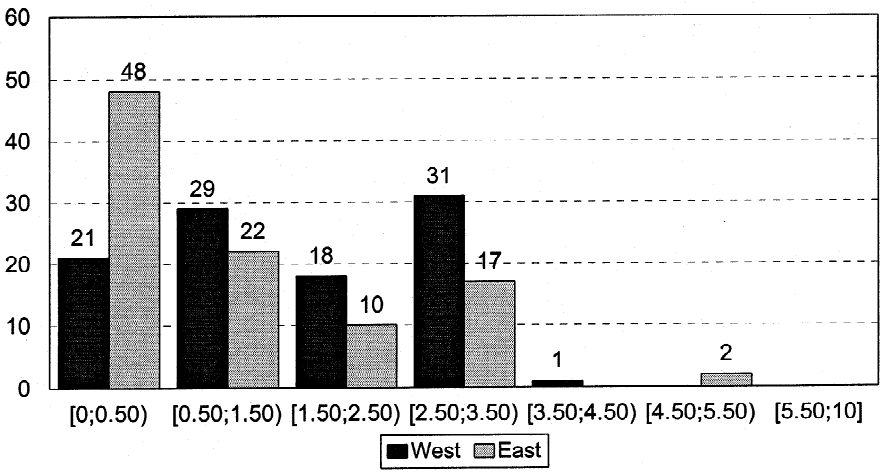

Fig. 5. Relative frequencies of choices x_2.

(χ^2-test, $p < 10^{-5}$, two-tailed). A two-tailed Mann–Whitney U-test supports the view that eastern subjects tend to give lower amounts ($p<0.0008$ in the case of x_1 and $p<0.0013$ in the case of x_2).

One aim of this paper is to emphasize the importance of taking into account the type-specific composition of subject pools in experimental studies. In the context of our cross-cultural solidarity study, for instance, one must not neglect the fact that the proportion of economists in the eastern sample (38%) is twice as high as the proportion of economists in the western data (19%). In view of the strong education effect reported in Selten and Ockenfels (1998)—students of economics were more likely to behave ''egoistically''—a similar effect could be the reason for the East–West effect described above. In order to obtain meaningful behavior comparisons, we applied χ^2-tests and Mann–Whitney U-tests to economists and noneconomists separately. For noneconomists the χ^2-test yields $p<0.001$ (two-tailed). Applying a two-tailed Mann–Whitney U-test, the null hypothesis that eastern and western noneconomists come from the same distribution can be rejected at a significance level of $p<0.02$ for x_1 and $p<0.03$ for x_2. The null hypothesis that eastern and western economists come from the same distribution cannot be rejected by either test. However, the means of x_1 and x_2 for western economists are with 1.49 and 0.89, respectively, clearly higher than the corresponding means for eastern economists, which are 1.05 and 0.64 for x_1 and x_2, respectively.

Analogous to the public good experiments, there are also some qualitative similarities in east and west behavior. For instance, if we restrict ourselves to those subjects who behave 'nonegoistical' (in the sense that they have chosen $x_1>0$ and

$x_2 > 0$), we cannot reject that the distribution of conditional gifts is the same in east and west (χ^2-test, $p > 0.5$ for both x_1 and x_2).[10]

3.3. Discussion

Our results reveal a clear east–west effect: while qualitative patterns are similar, eastern subjects invest less in public assets and sacrifice less money for solidarity. This leads us to ask whether eastern subjects could be regarded as more ''unfair'' or less ''cooperative''. In our opinion, this is a misleading judgment. Behavior might instead depend on norms which differ between the two parts of Germany.

Just as Selten and Ockenfels (1998) did in their paper, in the solidarity experiments, we asked all subjects what average conditional gifts they expected from others. Let $\hat{x}_1$ and $\hat{x}_2$ be the expected amounts announced for only one loser and for each of two losers, respectively, and let $\bar{\hat{x}}_1$ and $\bar{\hat{x}}_2$ be the corresponding means. If one compares the means of actual and expected gifts in Table 1, one notes a remarkable nearness within each type but, of course, not between types.[11]

If there exists a behavioral norm guiding the decisions in the solidarity game, people would expect that others behave according to this norm. Table 1 shows that, on average, decisions and expectations for each type are almost equal but differ significantly between types. In the aggregate, both types reveal a very realistic culture-specific idea of what can be expected in the solidarity game. Expectations were fulfilled within each population.[12] Therefore, if one reinterprets $\bar{x}_1 \approx \bar{\hat{x}}_1$ and $\bar{x}_2 \approx \bar{\hat{x}}_2$ as quantitative measures for the giving norm involved in the solidarity game, it is safe to conclude that the observed behavior differences are not the result of different behavior referring to the same norm but rather the

Table 1
Means of actual and expected gifts in eastern and western Germany

Conditional gifts	East		West	
	Actual	Expected	Actual	Expected
For one loser	1.62	1.60	2.46	2.47
For each of two losers	1.01	1.08	1.56	1.53

[10]Cf. Figs. 4 and 5 and observe that all subjects in the first interval in Figs. 4 and 5 chose zero conditional gifts for x_1 and x_2, respectively. In Ockenfels and Weimann (1997) we show that not only the distribution of conditional gifts but also the distribution of *qualitative* behavioral patterns of the nonegoistical subjects is the same in east and west.

[11]We excluded the expectations of two subjects from the eastern data set for all statistical computations. The expectations of one of those subjects were out of range. For the other subject, see Ockenfels and Weimann (1997).

[12]Furthermore, variances of expectations are considerably below the variances of decisions: In the eastern (western) data, we have $\text{var}(x_1) = 4.27$ (3.02) and $\text{var}(x_2) = 1.51$ (1.28) whereas $\text{var}(\hat{x}_1) = 1.94$ (1.60) and $\text{var}(\hat{x}_2) = 0.88$ (0.61). This observation supports the impression that subjects have an adequate type-specific idea of what can be expected in the solidarity game.

consequence of culture-specific norms.[13] Measured against these culture-specific norms, no subject-pool may be identified as more ''unfair''.

Given the above results, if one still wants to judge the differences between behavioral patterns in eastern and western Germany, a meta-norm must be introduced. Here, the question arises as to which meta-norm is the ''right'' one in the context of the solidarity game. A prominent answer might be that each subject should receive the *same payoff*. This outcome can only be guaranteed if all subjects within a group are willing to hand over one third of their winnings to each loser, regardless of the number of losers. Thus, since this norm would demand $x_1 = x_2 = 3.33$, at least on average, western subjects act more in solidarity. However, another, not less conclusive, proposal might be to demand that each subject should have the *same chance* of receiving a positive payoff. Since this norm is fulfilled if no subject gives positive conditional gifts, it becomes unclear which type behaves more ''fairly'' when considering this norm. Certainly, a ''rational'' choice of a meta-norm is not possible. The selection of a meta-norm in the solidarity game must be the result of a subjective evaluation. However, given the results presented in Table 1, we believe that fairness norms are a part of the different cultural identity in eastern and western Germany.

4. Conclusions

Cultural background seems to have a strong influence on individual cooperation and solidarity behavior. The underlying process leading to the observation that eastern subjects behave more selfishly than western subjects is unclear. One might think that eastern subjects have grown up in a socialistic system which produced a social dilemma: individual effort to expand production was not rewarded and therefore not rational. Each person had to develop strategies to overcome the scarcity resulting from the unsolved dilemma. This might lead to solidarity and cooperation in small nonanonymous groups such as families or near friends, on the one hand, but to egoism in large anonymous groups such as in firms, on the other hand. Note, that our experimental designs established anonymity through double blind settings. Furthermore, after the unification, selfish behavior might be considered as ''typical'' in a free market-oriented system, and this might ''justify'' selfish behavior.

What can we learn from the observation that different behavioral patterns exist? First of all we have to draw the conclusion that experimental economists should be careful in composing their subject pools. Different types may decide differently. The distribution over nationality, sex, origin, etc. is an important property of a

[13]Note that if $\bar{x}_i \gg \bar{\hat{x}}_i$ or $\bar{x}_i \ll \bar{\hat{x}}_i$, $i = 1, 2$, a 'stable' norm may not exist. If the game were repeated, subjects would adjust expectations and perhaps also behavior until average expectations match average behavior.

subject pool and should be taken into account when judging experimental data and extrapolating from laboratory behavior to other contexts. In this regard it is interesting to note that similarly to Selten and Ockenfels (1998) we found an interaction between gender and education. It is true, economists sacrifice significantly less for solidarity than noneconomists but a closer look reveals that this effect is restricted to males.[14] This superimposition of distinct type-effects seems to be stable and therefore may be responsible for the mixed results with respect to gender-specific behavior in dictator and public good experiments.[15]

But not only experimental economists can gain by recognizing that different types can be identified. In theoretical economics as well it seems promising to investigate cross-cultural norms and their evolution or, more generally, the influence of types on behavioral patterns. This investigation is promising for at least two reasons. Firstly, since economists are interested in understanding and achieving efficiency and since types systematically influence the degree of efficiency, we will get new insights into how to improve welfare. Secondly, if it turns out to be true that, after the age of normative decision theory in which homo oeconomicus dominated in economic models, the demand for a more successful *descriptive* theory of human behavior is coming to the fore, types may become important for economic theory. If individual behavior varies systematically over types, a *descriptive* decision theory can hardly neglect such information.

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References

Ayres, I., Siegelman, P., 1995. Race and gender discrimination in bargaining for a new car. American Economic Review 85 (3), 304–319.

Bolton, G.E., Katok, E., 1995. An experimental test for gender differences in beneficent behavior. Economic Letters 48 (3–4), 287–292.

Bolton, G.E., Ockenfels, A., 1997. ERC—A theory of equity, reciprocity, and competition. Working Paper, Penn State University.

[14]Ockenfels and Weimann (1997) offer a detailed statistical analysis of the interaction of gender and education in east and west.

[15]Cf. Bolton and Katok (1995) and Eckel and Grossman (1998) for dictator experiments and Brown-Kruse and Hummels (1993) for public good experiments.

Brown-Kruse, J., Hummels, D., 1993. Gender effects in laboratory public good contribution. Journal of Economic Behavior and Organization 22, 255–267.

Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie, 1995. Das soziale Bild der Studentenschaft in der Bundesrepublik Deutschland, Poppdruck, Langenhagen.

Burlando, R., Hey, J.D., 1997. Do Anglo-Saxons free ride more? Journal of Public Economics 64, 41–60.

Eckel, C.C., Grossman, P.J., 1998. Are women less selfish than men? evidence from dictator experiments. The Economic Journal 108, 726–735.

Frank, R.H., Gilovich, T., Regan, D.T., 1993. Does studying economics inhibit cooperation? Journal of Economic Perspectives 7 (2), 159–171.

Frank, R.H., Gilovich, T., Regan, D.T., 1996. Do economists make bad citizens? Journal of Economic Perspectives 10 (1), 187–192.

Ledyard, J., 1995. Public goods: a survey of experimental research. In: Kagel, J.H., Roth, A.E. (Eds.), Handbook of Experimental Economics. Princeton: Princeton University Press, 111–194.

Ockenfels, A., Weimann, J., 1997. Types and patterns: an experimental east–west comparison of cooperation and solidarity. Working paper, University of Magdeburg.

Rapaport, C., 1995. Apparent wage discrimination when wages are determined by nondiscriminatory contracts. American Economic Review 85 (5), 1263–1277.

Roth, A.E. 1995. Bargaining experiments. In: Kagel, J.H., Roth, A.E. (Eds.), Handbook of Experimental Economics. Princeton: Princeton University Press, 253–348.

Roth, A.E., Prasnikar, V., Okuno-Fujiwara, M., Zamir, S., 1991. Bargaining and market behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: an experimental study. American Economic Review 81 (5), 1068–1095.

Selten, R., Ockenfels, A., 1998. An experimental solidarity game. Journal of Economic Behavior and Organization 34, 517–539.

Statistisches Bundesamt, 1994. Zwischenörtlicher Vergleich des Verbraucherpreisniveaus in 50 Städten, Wirtschaft und Statistik 6/1994, 415–434.

Weimann, J., 1994. Individual behavior in a free riding experiment. Journal of Public Economics 54, 185–200.

Weimann, J., 1995. Freifahrer im Test-Ein Überblick über 20 Jahre Freifahrerexperimente. In: de Gijsel, P. et al. (Eds.), Ökonomie und Gesellschaft, Jahrbuch 12: Soziale Kooperation. Campus Verlag, Frankfurt, pp. 168–241.